invented by Airy and Clarke. Their results are extended and simplified "so that, out of the almost bewildering number of projections that have been discovered and advocated from time to time, those which are practically the best or most useful are reduced to comparatively few, the application of which has been simplified."

The first chapter (pages 1–21) deals with the minimum error zenithal projections, the second (pages 22–56) with the minimum error conical projections, the third (pages 57–65) with the conical orthomorphic projection with two standard parallels (Lambert's second) for the spheroid, the fourth (pages 66–68) with the polyconic projections, the fifth (pages 69–72) with finite errors of projections, and the sixth with the convergency of meridians. Mr. Young's survey has shown the worth of some old projections "which seem to have been hit upon by their inventors by a sort of geometrical intuition rather than by rigorous analysis." An example of this is Murdoch's remarkable third projection, dating back to 1758, and yet "the very best of the conical class." A discussion of G. W. Hill's conical projection (*Annals of Mathematics*, 1908) leads to the conclusion that it does not appear to have "any advantage over those we have investigated and it is certainly more difficult to compute."

The work is thoroughly mathematical and constitutes a most valuable contribution to the subject. It may be of interest to note in conclusion certain expansions of use in discussions of this kind: $\sin\theta$, $\cos\theta$, $\tan\theta$, $\cot\theta$, $\sec\theta$, $\operatorname{cosec}\theta$, $\sin^{-1}\theta$, $\tan^{-1}\theta$, $\log_e \sin\theta$, $\log_e \sec\theta$, $\log_e \tan\theta$, $\log_e(1+\theta)$, $\log_e(1-\theta)$, $\log_e[(1+\theta)/(1-\theta)]$ and $\tan(\theta+h)$ as a power series in h with coefficients powers of $\tan\theta$. Most of the expansions are to the eighth or ninth degree in θ.

Edinburgh's Place in Scientific Progress. Prepared for the Edinburgh Meeting of the British Association [1921]. Edinburgh and London, W. & R. Chambers, 1921. 12mo. 16 + 263 pages. Price 6 shillings.

This very interesting volume, with a preface by C. G. KNOTT, contains brief sketches on 25 topics by 23 different authors. "Mathematics and natural philosophy" is treated by C. G. KNOTT, pages 1–30; "Astronomy" by R. A. SAMPSON, 31–32; "Actuarial Science" by A. E. SPRAGUE, 33–35; "Meteorology" by A. WATT, 36–43; and "Engineering" by T. H. BEARE. Eight portraits are inserted in the volume, and the frontispiece in colors is of John Napier of Merchiston.

Among the numerous names occurring in Doctor Knott's sketch are the following: John Napier, James Gregory, David Gregory, Colin Maclaurin, James Stirling, James Ivory, John Playfair, John Leslie, William Wallace, Philip Kelland, D. F. Gregory, George Chrystal and P. G. Tait. It is stated that "in the light of accurate history" Napier "stands preëminent as the first great scientific Scotsman."

Mathematik in der Natur. By H. EMCH. Zürich, Rascher & Cie., 1921. 12mo. 86 pages. Price, paper cover, 2 francs.

This little volume was distributed free to subscribers of *Natur und Technik*, with Heft 12 of Jahrgang 1920–21. The eight chapters have the titles: Geometry in plant and animal bodies; Concerning architecture with the smallest building stones of the world; Where power to comprehend and to visualize is lacking, there mathematics always helps further; Mathematical fundamental problems of mechanics in nature; Number in plant and animal bodies; Cells, molecules, atoms, electrons. We here find brief references, in popular manner, to matters treated, for the most part, by D'Arcy W. Thompson, in his *On Growth and Form*, 1917, in more scholarly fashion. (Compare this MONTHLY, *1918*, 189–193, 232–238, where logarithmic spiral forms, golden section, and Fibonacci series are discussed; see also *1920*, 314.)

Grundzüge der Einsteinschen Relativitätstheorie. By AUGUST KOPFF. Leipzig, S. Hirzel, 1921. 8vo. 4 + 198 pages. Price, bound, 42.50 marks.

This introduction to the Einstein theory of relativity was developed from lectures, delivered in the winter semester of 1919–20 and in the summer semester of 1920, at the University of Heidelberg, where Dr. Kopff is extraordinary professor of astronomy. "It aims," the author states in the preface, "in the simplest possible way again to set forth the fundamental investigations of this theory, in connection with which a mathematical presentation can not be avoided. Without deep penetration into the mathematical problem of the theory of relativity, one can never really

understand the underlying thought. The theory of relativity belongs to theoretical physics in the widest sense and this is mathematical description of the physical processes of nature." In the course of the book the only assumed knowledge of mathematics and physics is such as is given in the first semesters at a university.

Fundamentals of High School Mathematics. A Textbook designed to follow Arithmetic. By H. O. RUGG and J. R. CLARK. Yonkers-on-Hudson, World Book Co., 1920. 15 + 368 pp. 12mo. Price $1.80. [Answer book, 16 cents.]

Attention is drawn to this work for first year high school mathematics, by teachers in the Lincoln School, New York. It is a development from their study, *Scientific Method in the Reconstruction of Ninth-Grade Mathematics* (University of Chicago Press, 1918, 8vo. 189 pages), and takes account of principles formulated by the National Committee on Mathematical Requirements. A rough draft "experimental edition" (8 + 266 pages) was published in 1918 and distributed at cost for experimental purposes only.

The Slide Rule: A Practical Manual. By C. N. PICKWORTH. Seventeenth edition. Manchester, Emmot & Co.; London, Emmot & Co., and Pitman & Sons, 1921. 12mo. 133 pp. Price 3 shillings and 6 pence (the New York agent, I. Pitman & Sons, charges more than double this price, namely, $1.50).

This book has been well known for twenty years, the eleventh edition appearing in 1908, the fourteenth in 1916, and the fifteenth in 1917, each of these editions containing revisions and new matter. The present edition contains eight pages more than the fourteenth, the additions including descriptions of new slide rules, and a section dealing with screw-cutting gear calculations by the slide rule.

NOTES.

In *Bulletin des Sciences Mathématiques*, July–August, 1921, there is a historical article by C. de Waard entitled "Une lettre inédite de Roberval du 6 Janvier, 1637, contenant le premier énoncé de la cycloïde."

In *Proceedings of the Benares Mathematical Society*, volume 2, part 2, 1920, is published "On mathematical research in the last 20 years," the presidential address delivered on January 31, 1921, by Dr. Ganesh Prasad, professor of mathematics in the Benares Hindu University. Compare *1921*, 31, 179, 191.

Revista Matemática Hispano-Americana, June, 1921, contains, pages 161–166, a portrait, brief biographical sketch, and bibliography of the writings (59 titles), of C. J. de la Vallée-Poussin.

The eleventh paper in *Proceedings of the Royal Society of Edinburgh*, volume 41, 1920–1921, is (pages 111–116) "Note on a continuant of Cayley's of the year 1874" by Sir Thomas Muir, the African member of our Association.

There are 81 names in the list of members of the "Gazeta Matematică" Society of Roumania, published in the first number, September, 1921, of *Gazeta Matematică*, volume 27.

The summer number of *Isis*, 1921, includes the following articles: "Two twelfth century algorisms" by L. C. KARPINSKI, 396–413; "History of symbols for n-factorial" by F. CAJORI, 414–418.

The fourth and last volume of E. BELTRAMI, *Opere matematiche pubblicate per cura della Facoltà di Scienze della R. Università di Roma*, was issued from the press of Hoepli, Milan, in 1920 (554 pages; price 50 lire).